

a second power source at below the ignition level of the fluorescent lamp for operating the fluorescent lamp continuously in the glow discharge mode [at a lower level of] in the low brightness range, and

switch means for connecting either said first or said second power source to the fluorescent lamp,

said second power source comprising one or more power generators for producing pulse modulated wave pulses of duty cycles less than 100% and in a frequency range of from 60-400 hz.

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Amended

R e m a r k

The title is being amended more closely to reflect the claimed subject matter of applicants' invention.

In the Office Action being responded to the Examiner has rejected all of the claims then being present as unpatentable, 35 USC 103, as obvious in view of Ohnishi et al Patent 5,804,924. In response thereto applicants are canceling claims 6, 7, and 16 in view of the protection afforded by the other claims and to expedite the prosecution of this application, and are canceling claims 1, 2, and 8, replacing claim 1 with a new claim 21 and replacing claim 8 with a new claim 22. Applicants are also amending other claims to correct their indications of dependency.

While applicants note that there does indeed appear, at first glance, to be some pictorial similarity between the Ohnishi et al disclosure and their invention, in fact there is no teaching or disclosure in the Ohnishi et al patent which would suggest to one of ordinary skill in the art applicants' invention. In fact, the Ohnishi et al teaching is really quite irrelevant to the problem faced by applicants and to their novel and unobvious solution.

Applicants' invention is directed to the problem of providing a dimming control so that a fluorescent lamp can operate continuously in the glow discharge mode in either a brighter or a dimmer range of brightness. The

Ohnishi et al patent doesn't mention dimming at all and is, in fact, directed to a completely different problem, one of no relevance to applicants' invention.

The Ohnishi et al teaching addresses the problem of lighting a discharge lamp *without* a current limiting (ballast) element. There are many reasons why one would wish to be able to operate without a ballast. Ballasts are noisy, heavy, bulky, and prone to failure. The teaching of Ohnishi et al is to apply a high voltage (greater than the sustaining voltage) to the lamp until the lamp current exceeds a first threshold value. When this first threshold is exceeded, then the Ohnishi et al device switches to a low voltage (below the sustaining voltage), until the current falls below a second threshold value (Col. 2, lines 52-61; Col. 3, line 59 to Col. 44, line 5, etc.). As is well known in the art and is clear from the Ohnishi et al disclosure, this switching must take place at a very high frequency as the discharge lamp's resistance characteristic changes from positive to negative very rapidly.

None of this is at all relevant to the problem of dimming the brightness of a fluorescent lamp. The Ohnishi et al disclosure and teaching is of an unballasted lamp drive, not a dimming lamp drive. Further, of particular significance to the distinctions between the Ohnishi et al teaching and applicants' invention, the Ohnishi et al circuit cannot be run continuously at either of their voltage levels. If the Ohnishi et al circuit were to run continuously at the higher level, the lamp would undergo current runaway (because it is unballasted at this level) and would very rapidly be destroyed. And if run continuously at the lower level, the lamp will extinguish almost immediately and will not restrike until a higher voltage is employed.

From the above it can be seen that the Ohnishi et al device will not run a lamp continuously at either of its two drive levels. However, this is precisely what applicants' dimming control system does. As now more clearly stated in the claims, as newly presented and amended, applicants operate their discharge lamp, and specifically a fluorescent lamp, continuously at either of two brightness range levels. Thus newly presented claim 21 recites the first

and second means which continuously maintain the operation of the lamp in the glow discharge mode in either of two ranges of brightness with a switch means enabling the second means to provide electrical energy to the lamp to dim the brightness of the lamp. Further, as recited, for example, in newly presented claim 22, the first power source supply comprises a source of high frequency voltage or current and the second power supply comprises a source of low frequency voltage or current "of a level sufficient to continuously maintain operation of the lamp in a glow discharge mode."

Turning now to the Examiner's specific statements with respect to the Ohnishi et al reference, applicants respectfully submit that the Examiner erred in stating that the reference discloses "a first means for providing electrical energy to the lamp to produce a first range of brightness....and a second means for providing electrical energy to the lamp to produce a second range of brightness (See Figures 1-3)". While Ohnishi et al do, in fact, disclose a circuit for providing two voltage levels to a discharge lamp, that is the only similarity with applicants' invention. Nowhere does Ohnishi et al disclose or suggest that this provides or is intended to provide the brightness levels, as stated by the Examiner. This is most fortunate because if the Ohnishi et al voltages were attempted to be used in this manner, one following the teaching of Ohnishi et al would be forced to choose between a high voltage that would destroy his discharge lamp and a low voltage that would be insufficient to cause the lamp to light. Ohnishi et al simply to not disclose or teach two voltage levels used to generate two different ranges of brightness to allow for dimming of the light from a fluorescent lamp. The Ohnishi et al device just does not work in this fashion and one following the teaching and disclosure of Ohnishi et al would not be led to applicants' invention.

In fact Ohnishi et al take great pains to ensure, and they fully disclose, that their method provides a *single* brightness, not two different ranges of brightness. They use the term "radiant noise" to denote a condition of multiple brightness. A vernacular term for "radiant noise" is "flicker". A primary concern of Ohnishi et al is that there be no perceptible brightness shift

result from their switching of voltage supplies. Their sequentially presented embodiments progressively minimize the variation from constant brightness and this is, in fact, the entire reason and motivation behind the Ohnishi et al invention. The prior unballasted discharge operations had suffered from "radiant noise" and the Ohnishi et al invention claims to have found a solution to this problem (Col. 2, lines 45-47), which is of course completely unrelated to the dimming of the brightness of a fluorescent lamp.

The Examiner has also stated that "Ohnishi discloses the second means (DC4) rendering voltage which is below the steady state voltage (V1a) (after the inverter circuit transforms the DC waveform to bipolar) (See Col. 3, lines 64-65 and Figure 22) continuously maintained in the glow discharge mode of the lamp (See Figure 24)." Applicants respectfully submit however that Column 3, line 64-65 does not support the Examiner's statement. Indeed, Figure 24 clearly shows that the lamp is *not* run continuously in the glow discharge mode, but is periodically driven with voltages which would either destroy the lamp in the case where

or would immediately extinguish the lamp in the case where

There is certainly no sense in having a dual driver where the choice of drives is either destructive or pointless.

The Examiner also refers to the Ohnishi et al "low brightness supply (DC4)". However, at no time do Ohnishi et al disclose or discuss a low brightness supply. Further at no time do Ohnishi et al disclose or discuss pulse width modulation, and, indeed, they are concerned almost exclusively with sinusoids. Further, and of course of critical significance, it is clear from their disclosure that Ohnishi et al never operate their discharge lamps in glow mode.

In rejecting prior claim 8, now replaced by new claim 22, the Examiner has stated that "Ohnishi discloses the frequency of the voltage exceeding the lamp steady-state voltage (e.g. the voltage from DC3) is made higher than the

frequency of the voltage below the lamp steady-state voltage (e.g. the voltage from DC4) (See Col. 3, lines 60-65, Col. 9, lines 51-54).” Applicants submit, however, that the Ohnishi et al disclosure, and specifically at the sections identified by the Examiner, does not support the Examiner’s conclusions. The discussion at Column 3 does not contain any reference to “frequencies” being a statement about DC voltages rather than about AC frequencies. The DC3 and DC4 are clearly DC voltages (as shown in Ohnishi et al Figures 1 and 2). Since the frequency of both DC3 and DC4 is zero, it is difficult to see how the frequency of one can be higher than the frequency of the other.

The disclosure at Column 9, lines 51-54 does indeed deal with frequencies of voltages above and below the lamp steady state voltage. From Column 9, lines 45-46 we are lead to the Ohnishi et al Figure 22 to see their disclosed mode of operation. From this it can be seen that Ohnishi et al do not continuously operate in either the high or low voltage mode but instead continuously switch between these modes. As noted above, the Ohnishi et al device can not continuously operate in either of their two modes.

Turning now to the claims, new claim 21 clearly recites that the first and second means provide electrical energy to the fluorescent lamp to continuously maintain operation of the lamp in the glow discharge mode, but in two different ranges of brightness, the system including “means for switching from the first means for providing electrical energy to the lamp to the second means for providing electrical energy to the lamp to dim the brightness of the lamp.” Such is clearly patentably distinct from the Ohnishi et al teaching and disclosure, as discussed above.

Claims 3 and 4 add that the second means comprise a source of pulse-width modulated bipolar pulses. Claim 5 further adds to new claim 21 that the first and second ranges of brightness overlap.

New claim 22 is directed to “A dimming control power supply system for a fluorescent lamp” and includes the first and second power supplies which continuously maintain operation of the lamp in two ranges of brightness, the

first power supply comprising a source of high frequency current or voltage and the second power supply comprising a source of low frequency current or voltage, and "a switch for switching between the first and second power supplies to cause dimming of the light of the lamp when said second power supply is connected to the lamp." Claims 9 through 15 are dependent, directly or indirectly, on new claim 22.

Claim 17, as amended, is directed to a dimming control system for operating a fluorescent lamp in either a high or low brightness range and including first and second power sources for causing continuous flow discharge in the high or low brightness range, the second power source comprising one or more power generators for producing pulse modulated wave pulses of duty cycles less than 100% and in a frequency range of from 60-400 hz. Claims 18 to 20 are dependent on amended claim 17; claims 19 and 20 both recite means for applying signals to transistors at an appropriate duty cycle for the low or dimmed level of brightness desired.

Accordingly, applicant submits that each of claims 21, 3, 4, 5, 22, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20 is clearly allowable. Favorable consideration or reconsideration and allowance of claims 21, 3-5, 22, and 9-20 are therefore respectfully requested.

Applicants have made a concerted effort carefully to refute the Examiner's rejection and to reduce the number of claims in order to expedite the prosecution of the application so as to place the application in condition for allowance. Accordingly, allowance of the application and passage of the

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$$|V_{rms}| > \sqrt{2} \cdot V1_a$$

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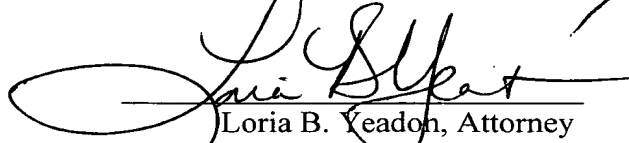
Claim 17, as amended, is directed to a dimming control system for operating a fluorescent lamp in either a high or low brightness range and including first and second power sources for causing continuous flow discharge in the high or low brightness range, the second power source comprising one or more power generators for producing pulse modulated wave pulses of duty cycles less than 100% and in a frequency range of from 60-400 hz. Claims 18 to 20 are dependent on amended claim 17; claims 19 and 20 both recite means for applying signals to transistors at an appropriate duty cycle for the low or dimmed level of brightness desired.

Accordingly, applicants submit that each of claims 21, 3, 4, 5, 22, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, and 20 is clearly allowable. Favorable consideration or reconsideration and allowance of claims 21, 3-5, 22, and 9-20 are therefore respectfully requested.

Applicants have made a concerted effort carefully to refute the Examiner's rejection and to reduce the number of claims in order to expedite the prosecution of the application so as to place the application in condition for allowance. Accordingly, allowance of the application and passage of the

application to issue are respectfully requested. However, if the Examiner believes it would in any way facilitate the prosecution of this application, he is invited to telephone applicants' attorney at the number given below.

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